

Technical Report

The Demystifying of Baker's Percentage

Contributed by Tim Healea

It's been more than a decade since Tom McMahon's technical reports on baker's percentage (*Bread Lines* Vol. 3, Issues 2 & 3) first appeared, and we thought it was about time we revisited this topic in the pages of The Guild newsletter. After participating in several of last year's education events for USA Tour 2006, we discovered while talking with professionals and home bakers that no other area of baking is more confusing or more misunderstood than baker's percentage — or “baker's math.”

One of the challenges in talking about baker's percentage to Guild members is that in the past there was not an agreed upon method to express baker's percentage. Several Bread Bakers Guild Team USA members and coaches — including Jeffrey Hamelman, Craig Ponsford, Didier Rosada, Noel Labat-Comess and Jeffrey Yankellow — recently developed a consistent, easy-to-read and easy-to-understand format for expressing bread formulas in baker's percentage. **From now on this format will be the Guild standard for sharing formulas.**

Why use it?

Let's take a closer look at baker's percentage and some of the features found in the standardized format. First, it is important to understand why baker's percentage is so critical to success. Listed below are just some of the benefits gained by using baker's percentage:

- **Consistent results.** Measurements in baker's percent are calculated by weight, ensuring consistent results on a day-to-day basis.
- **Flexibility.** Baker's percentage allows you to calculate exactly how much dough must be produced to meet specific production needs, while maintaining the correct ratios.
- **Ease in troubleshooting.** Baker's percentage can be used to quickly change hydration levels to account for changes in flour consistency

and can also be used to identify problems in a formula (i.e., if it is not balanced or if certain ingredient amounts are too high or too low).

- **Fixing scaling errors.** A baker can use baker's percentage to calculate additional ingredients needed to maintain a consistent formula if one ingredient is scaled incorrectly.
- **Communication.** Baker's percentage is a common language to bakers. It can be used to share formulas in a concise, universally understood way — even if the spoken language isn't the same.

Before we dive into a formula, let's review a few of the important basic guidelines for using baker's percentage:

1. All ingredients are measured by weight, including liquids; they should be measured using a consistent unit of measure, either pounds or kilograms.
2. The main ingredient in the formula — in this case, flour — is always considered 100 percent. When two or more flours are used in a formula, their combined total is always considered 100 percent.
3. The weights of all other ingredients are expressed as a percentage of the total flour weight.
4. Spreadsheet programs, such as Microsoft Excel™, are recommended to easily and quickly calculate formulas, depending on the desired quantity of bread.

Guild Standard

Now let's walk through an example using Jimmy's Bread from Bread Bakers Guild Team USA 2005. To make the formula easier to understand, we have simplified some of the numbers, which now differ from the original formula.

TOTAL FORMULA	%	Quantity (kg)
Flour	70.0	
Whole wheat	30.0	
Water	80.0	
Instant yeast	0.3	
Salt	2.0	
Peanuts	5.0	
Total	187.3	10.000 kg

Notice that there are two kinds of flour here — white and whole wheat flour — and that their sum is 100 percent. Also notice at the bottom of the percentage column, we have totaled all of the percentages that make up the formula. Now we can calculate the quantity of ingredients for a 10 kg batch of dough.

Although there is more than one way to do the calculations, here is one simple way: First, calculate the amount of total flour. We start by dividing the total percentages (187.3 percent) by the total flour percentage (always 100 percent). That equals 1.873. Then we divide the amount of dough you want, in this case 10 kg by 1.873.

$$\text{Amount of total flour} = \frac{\text{amount of dough you want (10 kg.)}}{\text{total of percentages/total flour percent (100)}}$$

$$\text{Total flour} = \frac{10}{1.873} = 5.339 \text{ kg.}$$

Subsequently, all of the ingredient amounts can be calculated by multiplying the percentage of each by the total flour weight. For instance:

$$\text{White flour} = 5.339 \times 70\% = 3.737 \text{ kg}$$

$$\text{Whole wheat flour} = 5.339 \times 30\% = 1.602 \text{ kg}$$

$$\text{Water} = 5.339 \times 80\% = 4.271 \text{ kg}$$

And so on. Note that the quantities are rounded to the thousandth, so that when using kilograms, the formula is accurate to the gram. The completed total formula would be:

Jimmy's Bread

TOTAL FORMULA	%	Quantity (kg)
Flour	70.0	3.737
Whole wheat	30.0	1.602
Water	80.0	4.271
Instant yeast	0.3	0.016
Salt	2.0	0.107
Peanuts	5.0	0.267
Total	187.3	10.000 kg

The calculations also work in reverse, so if you know the quantities of ingredients in a consistent weight, you can easily calculate the percentages of each ingredient. Remember, flour is always 100 percent, so just divide each ingredient by the total flour in the formula (in this case, 5.339 kg) to get the percentage of each corresponding ingredient.

Now, let's take the formula one step further and incorporate a preferment into the mix — in this case, a biga composed of whole wheat and white flour, with a hydration level of 65 percent. We will take a portion of the ingredients in our total formula and use them for our preferment. Let's say we want to use 33 percent of the total flour in the biga (1.762 kg), and for ease of scaling we will use all of the whole wheat flour, so we will need to add some additional white flour to the biga to use 33 percent of the total flour in the preferment.

We want to ferment the biga for 12 hours, and for our environmental conditions we will use a yeast percentage of 0.1 percent; because the whole wheat ferments more quickly than white flour alone, we will also add 0.5 percent salt to slightly

TABLE 1 • Jimmy's Bread — 33 percent total flour fermented in biga

TOTAL FORMULA	%	Quantity (kg)	BIGA	%	Quantity (kg)
Flour	70.0	3.737	Flour	9.0	0.160
Whole wheat	30.0	1.602	Whole Wheat	91.0	1.602
Water	80.0	4.271	Water	65.0	1.145
Instant yeast	0.3	0.016	Instant yeast	0.1	0.002
Salt	2.0	0.107	Salt	0.5	0.009
Peanuts	5.0	0.267	Peanuts		
Total	187.3	10.000 kg	Total	165.6	2.918 kg

inhibit the yeast activity. Our formula would begin to look as shown in **Table 1**.

Notice that we started with the quantity of the whole wheat flour (1.602 kg) and added additional flour (0.160 kg) to make up the 33 percent total flour fermented in the biga (1.762 kg). Now, we can use the total flour amount to finish the calculations. For instance:

$$\text{Percentage of white flour} = 0.160 / 1.762 = 9\%$$

$$\text{Percentage of whole wheat flour} = 1.602 / 1.762 = 91\%$$

$$\text{Amount of water} = 1.762 \times 65\% = 1.145 \text{ kg}$$

$$\text{Amount of yeast} = 1.762 \times 0.1\% = 0.002 \text{ kg}$$

$$\text{Amount of salt} = 1.762 \times 0.5\% = 0.009 \text{ kg}$$

Now, we need to add the last column for the final dough. We start with the ingredients in the total formula, subtract the ingredients that are already in the biga, and we are left with the quantity of ingredients that need to be incorporated in the final mixing of the dough as shown in **Table 2**.

For clarity, we suggest not calculating the percentages for the final dough, because they can be misleading and confusing, especially for those new to baker's percentage. They will

not give you an accurate picture of the total hydration in the formula, and they will give you a skewed picture of the amount of salt and yeast in the total formula. Knowing the percentages for the total formula, along with the percentage of total flour fermented in the preferment, are the most important pieces of information to understanding and evaluating the formula.

Next steps

Practice, practice, practice! The best way to learn baker's percentage is to use it over and over until you are completely comfortable with it. As one great baker said: learn it, use it, live it.

Take a formula expressed in percentages and calculate the amount of ingredients for various batch sizes, or take a formula in a baking book and figure out the percentage for each ingredient. Baker's percentage is the most powerful tool bakers have to consistently bake quality bread. For more discussions of baker's percentage, visit Craig Ponsford's baker's percentage lesson on www.artisanbakers.com or review the appendix of Jeffrey Hamelman's book, *Bread: A Baker's Book of Techniques and Recipes*. Good luck and happy baking!

TABLE 2 • Jimmy's Bread — 33 percent total flour fermented in biga

TOTAL FORMULA	%	Quantity (kg)	BIGA	%	Quantity (kg)	FINAL DOUGH	Quantity (kg)
Flour	70.0	3.737	Flour	9.0	0.160	Flour	3.577
Whole wheat	30.0	1.602	Whole wheat	91.0	1.602	Whole wheat	0.000
Water	80.0	4.271	Water	65.0	1.145	Water	3.126
Instant yeast	0.3	0.016	Instant yeast	0.1	0.002	Instant yeast	0.014
Salt	2.0	0.107	Salt	0.5	0.009	Salt	0.098
Peanuts	5.0	0.267	Peanuts			Peanuts	0.267
Biga			Biga			Biga	2.918
Total	187.3	10.000 kg	Total	165.6	2.918 kg	Total	10.000 kg